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ABSTRACT

Teacher education programs have often attempted to make teachers more rational by use of apriori models. These models poorly correspond to teachers' thinking styles. Three distinct reactions to this problem have occurred. One proposed solution is to break the apriori model into separate component skills and to train teachers in each skill. A second approach is to train teachers to operate according to the apriori models of rationality and to apply the learned principles in the classroom. The third approach suggests that the discrepancies between theory and practice demonstrate that teachers should not be pressed into these preformed molds. It is most desirable to enable teachers to be rational by helping them choose effective strategies. Since few teachers follow the steps provided in the apriori model, it is important to understand how teachers make decisions. Teacher education programs which prescribe teacher behavior are miseducative. Current research on teacher thinking should not provide prescriptions that may serve as the content of preservice or inservice teacher training programs. (JN)

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Abstract

Programs of teacher education have often tried to make teachers follow apriori models of the rationality. These models poorly fit how teachers actually think. Rather than concluding that even more teacher training is required, recent research on teacher thinking has tried to uncover the rationality underlying teachers' practice. The temptation to demand conformity to the new models of rationality uncovered should be resisted. Instead, the research on teacher thinking should be used to make teachers aware of possible modes of thought, to give teacher educators a sense of how their students may change, and to give inservice educators an idea of how their students may view instruction.

Should Teachers Be Taught to Be Rational?

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Introduction

Rather than keeping you in suspense, we will immediately answer the question in our title: "It depends." It depends on the interpretation of "taught" and "rational." This answer is not an evasion as we will try to make clear.

Programs of teacher education have often tried to make teachers more rational. Teachers have been taught to follow some simplified version of the Tyler rationale--going through steps of stating objectives, selecting experiences, organizing experiences and evaluation. Particularly in the last decade, models of rational decision making have been applied to teaching situations and researchers have suggested that teacher education programs "train teachers in the individual components of decision making and then [train them] to integrate these components into smooth teaching performance" (Shavelson, 1976, p. 403).

In all these cases "teach" means train and "rational" is defined in terms of an a priori model of appropriate action. In the case of the Tyler rationale, the a priori model is a simplified interpretation of the approach Tyler actually suggests. In Shavelson's case, the a priori model is based on a mathematical model for choosing alternatives based on expected (in the statistical sense) benefits.

Both of these rational models poorly fit how teachers think. For one thing, many teaching situations do not allow time for systematic

weighing of alternatives (see e.g., Jackson, 1968, p. 151). But even in cases where time is available, teacher decision making is not always rational as defined by these a priori models.

Three distinct reactions have followed. First, some have concluded that teachers need to be shaped up. The discrepancies between the a priori models of rationality and the ways in which teachers actually think and make decisions show how much work needs to be done to change teachers. The problem is that we haven't been effective enough in our teacher training. One proposed solution is to break the a priori model into separate component skills and to train teachers in each skill. Another approach is to discover more effective training procedures. In any case, the fault lies with the teacher or the training, not with the model of rationality.

A second reaction has been to look for times when the model of rationality provides a better fit. True, teachers seldom have time to consider alternatives during the press of interactions with students, but they do have time during planning periods or at the end of the school day. Perhaps the model can't be used to improve interactive teaching, but it can improve preactive training. Teachers can still be trained to operate according to the a priori models of rationality, but the learned skills are to be applied in the quiet of an <u>empty</u> classroom, not in the rush of working with twenty youngsters.

While both of these reactions assume that teachers should be taught (trained) to be rational (to fit an a priori model of action), the third reaction is to conclude that the discrepancies between theory and actual practice show that teachers should <u>not</u> be pressed into these pre-formed molds. Instead the real constraints of

classroom teaching (time constraints and others) make rote following of these a priori models inappropriate. Although teachers do not engage in conscious and systematic deliberation, they still have good ways of thinking about what they are doing, even if those ways do not closely approximate the a priori models. Teachers develop heuristic strategies for dealing with the fast-moving complexity of the classroom; some of these shortcuts are better than others. Teachers are rational in their actions, not as defined by an a priori model of action, but as defined by choosing appropriate means to reach their goals. This third reaction suggests that it would be desirable to enable teachers to be rational, in the sense of helping them choose effective strategies. Whether and how this kind of rationality can be taught is an open question.

A first step is to get a clearer idea of what such rationality is. What are some of the effective ways teachers have of making rapid instructional decisions? One approach to this question is to study the thought processes of teachers as they go about their work. Such studies are among those being conducted at the IRT, investigating, for example, what strategies teachers use in handling various types of children who cause problems for the teacher. Studies of the thought processes of teachers may prove more beneficial to teacher education than repeated attempts to fit teachers into some rational mold.

Teaching is an activity well suited to Aristotle's comment that "men who know nothing of the theory of their subject sometimes practice it with greater success than others who know it" (1953, p. 180). If the ways in which skilled practitioners think lead them to produce

good results, we may be able to use their practical wisdom to help preservice and inservice teachers.

> Many teachers are engaged in a high level of problem-solving in their everyday interaction with children. They may not think of themselves as "intellectuals" because they are not accustomed to talking in detail about what they do. But, in fact, their level of intellectual activity is very high and their skillful practice depends on well-developed mental coordinations. It is important to listen to such people, to take what they are doing seriously, to support them in their own inquiry, and to find ways of sharing what they have learned with others (Hull, 1978, p. 36).

We support the shift from thinking about teacher rationality in terms of a priori theoretical models to thinking about it in terms of teacher thought processes that are actually effective. But we are concerned that the interpretation of "taught" will continue to emphasize training. The notion of forcing teachers into a priori molds may be replaced by the notion of forcing teachers into molds based on practice of some number of teachers who are the subjects of research. Many of the problems encountered in trying to shape teachers' thinking to fit a single model of rationality may remain while additional problems could also arise.

Perhaps a concrete example of IRT research on teacher thinking will help you imagine what can be learned and how it might be used (or misused) in teacher education.

One area in which teachers must make decisions is the selection of content for instruction. Even assuming that reading and mathematics will be included in the elementary school curriculum does not specify what particular topics will be covered in these areas. An a priori model of rationality might prescribe the specification of general goals of schooling, an assessment of the particular students in the teacher's

class this year, and a systematic sorting of the potential topics to find those most appropriate for inclusion. Since the teacher finds out more about the students as the year progresses, the rational model would presumably prescribe periodic review of the initial plans for content coverage. The selection of content coverage is not only a decision that all teachers must make, but one that is extremely important. Teachers do differ in their selections, even holding grade level and achievement of students constant. In fact, the topics teachers choose to cover may be the single most important source of differences in what children learn.

Few teachers follow the steps prescribed in an a priori model. Rather than trying to correct this "problem" by devising means to change teacher behavior, we might try to understand how teachers do make these important decisions. What strategies do teachers actually use to choose instructional content? How do they think about that content in making their decisions?

These questions are too broad to be answered by a single research study and they frame the work of a number of separate studies of the Content Determinants project in the IRT. We will sketch the work of two studies conducted by members of this project. The first considers the way in which teachers respond to various outside pressures in making content decisions. The second examines the concepts that teachers use in structuring their thoughts about the possible domain of topics.

A major goal of the Content Determinants project is to describe the ways in which teachers think in making decisions about what content to present to their class. The project has focused on fourth grade mathematics, with some work at the third and fifth grades.

Teachers receive a variety of messages about what should be taught in fourth grade mathematics. Many school districts distribute lists of mathematics objectives, often with suggestions of the grade level at which each objective should be mastered. Standardized tests administered in a district include items on some mathematics topics (but not all), suggesting areas that might be covered. Textbooks present topics in a specific order, and usually suggest how many days should be spent on each topic. The other teachers in a school may indicate topics they expect children to master before moving to fifth grade. Parents may ask why topics they never learned should be taught to their children. Subject matter associations present definitions of basic skills and ideas for enrichment.

Since it is unlikely that the teacher could cover all the content suggested by all these sources, and since the messages received may often be in conflict, decisions must be made about which messages to heed and which to ignore. Teachers may even choose to ignore all external pressures and teach the topics they themselves consider most important. Through a variety of substudies (Porter, Belli, Floden, Freeman, Knappen, Kuhs, Schmidt & Schwille, Note 1), the Content Determinants project is attempting to find out how teachers think about these messages (and other factors) in coming to a decision about what to teach to their children this year.

In one substudy (Floden, Porter, Schmidt, Freeman & Schwille, in press, teachers were presented with descriptions of hypothetical school districts and asked to imagine what they would do if transferred to this district. Each description specified the presence of one or more factors pressing for the addition of five mathematics

topics and the deletion of five different topics. By modeling how teachers weighted each pressure or combination of pressures, one could see whether, for example, teachers gave greater weight to a factor describing a mandated textbook, than they did to a factor describing pressure from parents. A tentative (and partial) picture emerged of how teachers combined information from various content messages in making decisions about what to teach.

Perhaps the most striking things learned from this study were (1) the general willingness of teachers to add topics, whatever the source of the pressure, and (2) the general reluctance of teachers to drop old topics in order to accommodate the new ones. At least from this study, it seems that teachers respond to content messages brought to their attention. A puzzling question for further study is which real life content messages they do attend to. A limitation of this study is that the teachers were told to assume that all the content messages were consistent, e.g., all factors called for the same five topics to be included.

Another substudy of the Content Determinants project is an attempt to find out what teachers think about the content of mathematics taught at their grade level (Schwille, Belli, Floden, Freeman, Knappen, Kuhs, Porter & Schmidt, Note 2). What are the major divisions into which specific topics fall? What composes each of those major divisions? What topics can be considered essentially the same when making content decisions and which must be distinguished? For example, is there any important difference between addition facts presented vertically and addition facts presented horizontally? Finally, how are the various topics and subtopics related to one another?

Using interviews of twenty teachers in a suburban school district, members of the project are summarizing the content of elementary mathematics, as seen by these teachers. Comparisons are being made to what members of the research project think about elementary mathematics content (Kuhs, Schmidt, Porter, Floden, Freeman & Schwille, Note 3), describing the domain of topics using dimensions of General Intent, Nature of Material and Operations. The taxonomy has been used to describe the content implicit in factors such as tests and textbooks (Freeman, Kuhs, Belli, Floden, Knappen, Porter, Schmidt & Schwille, Note 4). The current research will help determine how well what the researchers think about mathematics content matches what the teachers think about it.

Data analysis for this study is not yet complete, but it seems that the two perspectives on mathematics content will agree in many respects. A notable exception is that teachers see "money" as a separate category on a level with addition or fractions, while the researchers subsumed money problems in other categories, e.g., under work with decimals.

Some problems in using research on teacher thinking to improve teacher education

Teacher educators reading reports of such research might be tempted to apply the research to their teacher education programs by explicitly training their students to adopt the thinking of teachers in the studies. That is, teacher educators may be tempted to impose a model of rationality based on the thinking of teachers described in these research studies. This temptation should be resisted.

Using research results in this way has a certain plausibility, particularly for preservice education. Direct training would enable the preservice teacher to short cut the gradual shaping of thought by experience. If the training were effective the teacher could enter the first year of teaching already thinking like a teacher of long experience.

Two problems are evident: First, just because an experienced teacher thinks in a particular way is not reason enough to prescribe this way of thinking. Second, even admitting that it might be good for beginning teachers to learn to think as experienced teachers do, it is arguable whether direct training in these thought patterns is the right way to bring about this learning.

We need to learn from the wisdom of practice, but that wisdom is not uniformly spread across all practitioners. Nor is it likely that good teachers are equally wise in all aspects of their work. Since much of the research on teacher thinking has not sought exceptional teachers to study, it would be a mistake to think that the thinking of the teachers studied would be a good model for other teachers. Just because some (or even many) teachers see topics related to money as a major area in mathematics, is that any reason for other teachers to think the same? The answer is clearly no. A description of current practice may be as likely to provide examples of things to avoid as of things to emulate. The choice between avoidance and emulation must be based on grounds other than the frequency of occurrence among current practitioners. Studies of what, how and why teachers think cannot by themselves provide

defensible content for a teacher training program, i.e., cannot provide prescriptions to be followed by teachers in training.

Perhaps this first problem could be solved by some procedure for selecting superior teachers to study, or by identifying types of teacher thinking associated with desired student outcomes. But it would still not be clear that one should prescribe such thinking for other teachers.

Virtually all the difficulties that arise in trying to apply research on teacher behavior to teacher education will reappear when trying to apply research on teacher thinking. Fenstermacher (1979) has argued (not always persuasively, see Floden, in press) that findings from research on teacher behaviors should not be adopted as prescriptions for teachers to follow. For one thing, these findings usually only establish a statistical association between teacher behaviors and student achievement. What may be most effective in producing student learning over all teachers and classrooms may not be effective for the particular situation in which a teacher is placed. One can even raise questions about whether the statistical associations properly represent causal relationships producing student learning. Perhaps the "effective" teacher behaviors are good means for picking the effective teachers from the current population, but do not represent the things that make them good teachers. The length of a student's hair in the 60's might have shown a strong statistical relationship with political leanings, but it is hardly plausible that current shorter hairstyles are the cause of any concomitant shift to the right.

More importantly, Fenstermacher insists that any teacher education program that prescribes teacher behaviors is mis-educative, and will thus lead to teachers incapable of properly educating children.

Modeling is a powerful factor in the education of youngsters, and a teacher who has been trained during professional preparation may be incapable of modeling the actions of an educated person. Teacher education must honor the reason of the prospective teachers if those teachers are to honor the wisdom of their students.

The validity of Fenstermacher's conclusions is not dependent on the use of research on teacher behaviors as a source of prescriptions. It may even be worse to draw prescriptions from research on teacher thinking, since this would more directly deny the appropriateness of teachers' own powers of thought.

Current research on teacher thinking should not provide prescriptions that could serve as the content of preservice or inservice teacher training programs. Even if one did have descriptions of wise teacher thinking, training other teachers to think in the same wise manner is problematic. One should not teacher teachers to be rational, if this means prescribing a new model of rationality, whatever its source. Other methods must be found for using these research results to improve teacher education.

Uses of Research on Teacher Thinking

Rather than serving as a model for preservice and inservice teachers, descriptions of teacher thinking can stimulate the thinking of teachers and teacher educators. Teachers can see the variety of ways that teachers think, but also the modal patterns toward which they themselves may be destined. Teacher educators can get a clearer sense of how their preservice students may change, and how their inservice students are likely to view the instruction taking place in workshops and seminars.

Descriptions of teacher thinking can serve to make teachers more aware of their own thinking and to heighten the sense that alternative ways of thinking are possible. Many teachers may never have stopped to consider how they react to suggestions for modifications in instructional content. Teachers participating in the study of influences sometimes mentioned to the researchers that participation in the study made them reflect on their reactions and decide to alter them. Teachers may carefully examine their own ways of choosing content after seeing how willing other teachers have been to add topics and how reluctant to delete them. A self-examination has greater import when the teacher becomes aware of the range of actual responses. A teacher who thought that compliance was the only option may see that other practioners fail to comply and still manage to survive. The alternatives described may include possibilities of which a teacher was unaware; seeing the range may also motivate speculation about further alternatives.

Such a use of research results in teacher education does not involve prescription of ways in which teachers should think. Discussions of the strengths and weaknesses of the ways of thinking described can be an educative experience for teachers. Research results can serve as the concrete basis for discussion of professional practice. Through discussions of alternative ways of professional thinking, teachers gain greater ability to deliberate about practical problems. Since no one way of thinking is prescribed, it is not necessary for the teacher educator to draw conclusions about causal effects of patterns of teacher thinking. Many ways of thinking can be

considered, and teachers can be encouraged to investigate which way of thinking works best for them in their classrooms.

The educative use of results from research on teacher thinking may lead to teachers who are more rational in the sense that they place greater reliance on their own reasoning powers and have greater ability to compare various ways of professional thinking. This may be teaching teachers to be rational, where "teaching" is contrasted with "training," and "rational" is interpreted as the ability to consider various approaches to a problem, rather than as fitting some a priori model of thought. With this broad interpretation, we might agree that teachers should be taught to be rational.

Descriptions of teacher thinking may also improve teacher education by giving teacher educators a clearer picture of their students. Preservice teacher educators can see how practicing teachers think about their work, and contrast these descriptions with the beliefs and habits of thought teacher educators hoped to instill. It is a truism that practitioners of any field think about practice in ways far different from the images promoted by professional educators, e.g., teacher educators or legal educators. Perhaps by providing detailed descriptions of practitioners' thinking, researchers can allow teacher educators to deal constructively with these differences.

Inservice teacher educators could better predict the results of their efforts if they knew how, what, and when teachers currently thought about their work. For example, a workshop designed to promote the teaching of geometry may lead to the inclusion of this topic at the expense of less time spent on other topics. A teacher educator who realized a teacher's reluctance to drop topics might make a

special effort to encourage the deletion of a particular topic so that teachers would concentrate their efforts on a smaller number of topics. Knowledge of teachers' ways of thinking about mathematics content could enable the teacher educator to link new topics to the teachers' present mental organization, rather than showing links that a mathematician (or a mathematics educator) would see.

Of even more help to teacher educators would be results from research on why teachers think as they do. Research in this area would indicate the means that could be used to avoid undesirable aspects of teacher thinking. But such research is difficult to conduct and we know of little work in this area beyond the studies of matches between philosophies of student teachers and their cooperating teachers.

In summary, the answer to the question in our title crucially depends upon the interpretations given to "teach" and to "rational." If the question refers to teacher educators prescribing ways of thinking for pre and inservice students, we would answer in the negative. Results from research on teacher thinking could lend an air of scientific authority to these prescriptions, but could not justify the approach. If the question is whether teachers should be educated to enhance their abilities to deliberate about the difficult problems in their work, we would answer yes. Teachers should be educated to think seriously and clearly about their complex tasks, and results of research on teacher thinking can be one useful source of material for this education. But there are no patented ways of making the best practical decisions in teaching, and it is a vain hope that research

on teacher thinking could save teachers from having to do the hard work of deliberation on their own. This point is well stated in a commentory on Aristotle's conception of deliberation in practical reasoning. After concluding that Aristotle provides no formula to be followed, Wiggins says:

> I entertain the unfriendly suspicion that those who feel they must seek more than all this provides want a scientific theory of rationality not so much from a passion for science, even where there can be no science, but because they hope and desire by some conceptual alchemy, to turn such a theory into a regulative or normative discipline, or into a system of rules by which to spare themselves some of the agony of thinking and all the torment of feeling and understanding that is actually involved in reasoned deliberation (Wiggins, 1978, p. 150).

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